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(54) Title: **HIGH-THROUGHPUT METHODS OF DISTINGUISHING AT LEAST ONE MOLECULE INDIVIDUALLY IN A SAMPLE COMPRISING MULTIPLE MOLECULES AND SYSTEMS FOR USE THEREIN**

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(57) Abstract: A high-throughput method of distinguishing at least one molecule individually in a sample comprising multiple molecules, which method comprises: subjecting a sample comprising multiple molecules, at least one molecule of which is detectably labeled, to electrophoresis; imaging the electrophoretic mobility of each detectably labeled molecule over time by detecting the position of the detectable label of each detectably labeled molecule over time, and, optionally, at the same time, dispersing the imaging by a transmission grating for spectroscopic analysis, and determining the electrophoretic mobility of each detectably labeled molecule and, optionally, determining the molecular spectrum of each detectably labeled molecule, thereby distinguishing at least one molecule individually in a sample comprising multiple molecules, and a system for use in such a method. A second high-throughput method of distinguishing at least one molecule individually in a sample comprising multiple molecules, which method comprises: introducing a sample comprising multiple molecules in free solution, at least one molecule of which is detectably labeled, into a sample channel; simultaneously imaging the position of each detectably labeled molecule, by detecting the position of the detectable label of each detectably labeled molecule, and dispersing the imaging by a transmission grating for spectroscopic analysis, and determining the molecular spectrum of each detectably labeled molecule, thereby distinguishing at least one molecule individually in a sample comprising multiple molecules, and a system for use in such a method.